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Titanophora marianensis sp. nov. (Nemastomataceae, Rhodophyta) from Guam[1]

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ABSTRACT: *Titanophora marianensis* sp. nov. (Gigartinales) from Guam is distinguished from other previously known species of the genus by having leading axes that branch repeatedly and by the absence of gland cells.

SEVEN SPECIES OF *Titanophora* have been described previously. They are *T. pikeana* (Dickie) J. Feldmann (1942) from Mauritius and Ceylon; *T. weberae* Børgesen (1943) from New Guinea, Mauritius, Solomon Islands, and Japan; *T. incrustans* (J. Ag.) Børgesen (1949) from southeastern United States; *T. mauritiana* Børgesen (1949) from Mauritius; *T. calcarea* (Okamura) Børgesen (1949) from Ponape; *T. pulchra* Dawson (1954) from Viet Nam; and *T. palmata* Itono (1972) from Japan. An eighth species is recognized from Guam and is described below.

MATERIALS AND METHODS

These observations are based on three well-preserved dried specimens mounted on herbarium sheets. Slides for microscopic examinations were prepared by decalcifying small portions with weak HCl, staining with 1 percent aqueous aniline blue, fixing the stain with a drop of about 5 percent HCl, and mounting the materials in 50 percent corn syrup.

Titanophora marianensis Itono et Tsuda, sp. nov.

DESCRIPTION: Thallus ca 13 cm altus, subflabellatus, complanatus, irregulariter palmato-divaricater ramosissimus, radice parvo disciformi ad substratum adfixus, calcificatus tantum in medulla; superficie thalli in sicco farinosa et substantia fragilissima; rami ad apicem versus tenuiores, furcati, apicibus acutis, interdum ex marginibus proliferis; glandicellulum abest; cellulae auxiliares in filamentis assimilantibus intercalares; gonimoblasts singulatim in cellulis auxiliaribus initiantur et ad superficiem thalli crescunt; duae involucrae ex cellula auxiliare exortae et involucrum circum carposporophyta formantur; ostiolum rotundatum in strato corticali formantur; thalli spermatangiis et tetrasporangiis ignota.

Thalli are up to 13 cm tall and 0.8–0.9 mm thick. The holdfast is a fleshy disk about 1 mm in diameter, giving rise to a short terete stalk. The stalks measure up to 4 mm long and 0.8 mm in diameter, and expand directly into the leading axes which branch repeatedly (Figure 1). The leading axes are complanate and 6–11 mm wide, while the terminal branches are narrower and frequently subterete.

The thalli are composed of a broad filamentous medulla of elongate unpigmented cells. The medullary filaments are irregularly branched and merge at the periphery with two to three spherical cells of the cortical layer and an outer spinous peripheral cell layer (Figure 2*a*). The gland cells characteristically found in *Titanophora* are absent in all parts of the thalli.

The carpogonial branches and prefertilization stages of the female reproductive organs were not observed in the present materials. The auxiliary cells (Figure 3) are situated near the outer layers of the medulla

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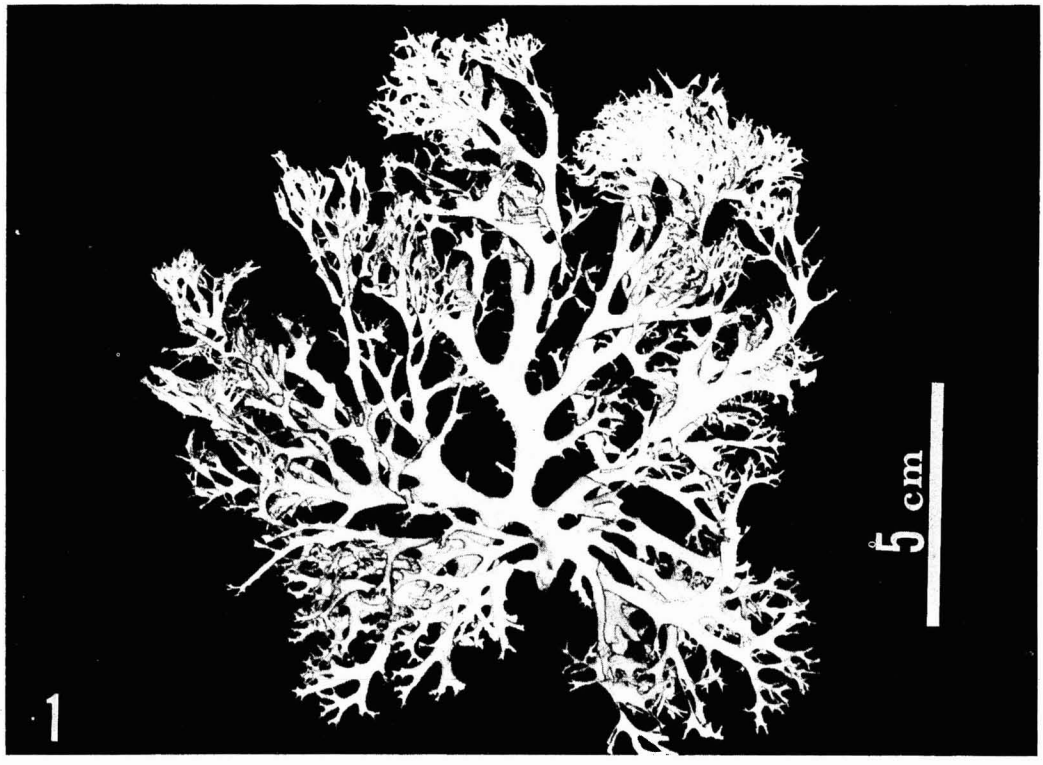

FIGURE 1. Habit of holotype specimen (RT 5350a) of *Titanophora marianensis* sp. nov.

and are intercalary in the assimilatory filaments. They are oval and much larger than the vegetative cells and are easily distinguished when stained with aqueous aniline blue. The gonimoblast initial is cut off toward the thallus surface from the auxiliary cell and subsequently divides into one gonimolobe (Figure 2*b*) of tightly compacted cells, which almost all mature into carposporangia, and a remnant of another, which is small and rudimentary (Figure 2*b*). As the carposporophyte develops, mature gonimoblasts are surrounded by two involucral filaments that are produced on the lateral sides of the auxiliary cell (Figure 4). The cells of the involucre are elongate and distinct from those of the vegetative filaments. There is a prominent carpostome (Figures 5, 6) on the thallus surface just above the carposporophyte.

Spermatangial and tetrasporangial thalli were not found.

HOLOTYPE: The cystocarpic specimens (RT 5350a–c) were collected on 17 May 1977 by J. Eads on the submarine terrace in water 38 m deep off Fadian Point, Guam. Holotype RT 5350a is deposited at the Herbarium, Faculty of Science, Kagoshima University. Syntypes RT 5350b and RT 5350c are deposited at the Herbarium, University of Guam.

DISCUSSION: The features of the mature carposporophytes are generally similar to those of other species of *Titanophora* (Børgesen 1943, Itono 1972), i.e., intercalary auxiliary cells on the outer layers of the medulla, conspicuous carpostomes on the surface layers above the carposporophytes, gonimoblast initial that forms one obvious gonimolobe and a remnant of another, and the manner of division in the auxiliary cells. The chalky incrustation of the fronds and other vegetative structures of the Guam

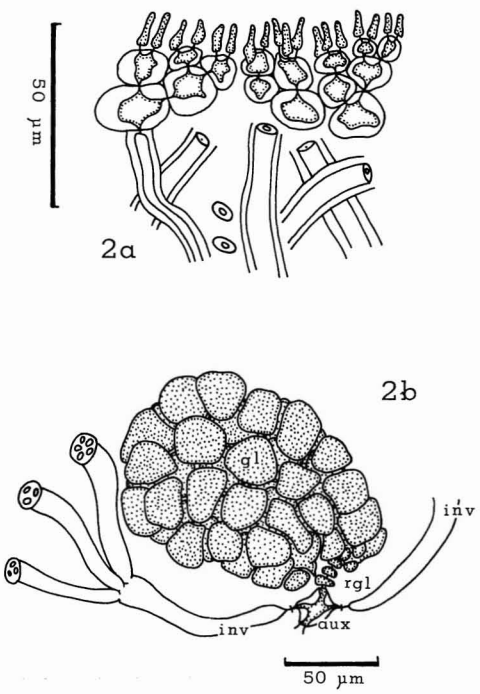

FIGURE 2. *Titanophora marianensis* sp. nov. *a*, section showing portion of filamentous medulla, globose cortical cells, and spinulose epidermal cells; *b*, mature cystocarp showing two involucral filaments (inv) on the lateral sides of an auxiliary cell (aux) and two types of gonimoblasts, one of which grows into mature carposporangia (gl) while the other remains rudimentary (rgl).

specimens also characterize this species as a member of the genus *Titanophora*.

In their external features, the branched specimens from Guam resemble *Titanophora pikeana* and *T. weberae*, which are essentially blades with proliferous margins and may be cleft. These two species, however, have conspicuous gland cells in the cortical layers, unlike our new species from Guam. The presence or absence of gland cells is regarded as an important taxonomic criterion (Feldmann 1942) in distinguishing certain genera of the Nemastomataceae. Although *Nemastoma confusum* Kraft et John (1976) showed features of both *Nemastoma* and *Platoma*, the authors place it in the genus *Nemastoma* mainly on the basis of its gland cells. In this respect, the occurrence of species with and without gland cells in the genus *Titanophora* is very notable. Only one other species, *T. pulchra*, has been described (Dawson 1954) as lacking gland cells, and this absence was noted as distinctive. *Titanophora pulchra* is distinct from our new species by having numerous small, subacute excrescences on the flat surfaces of the thallus.

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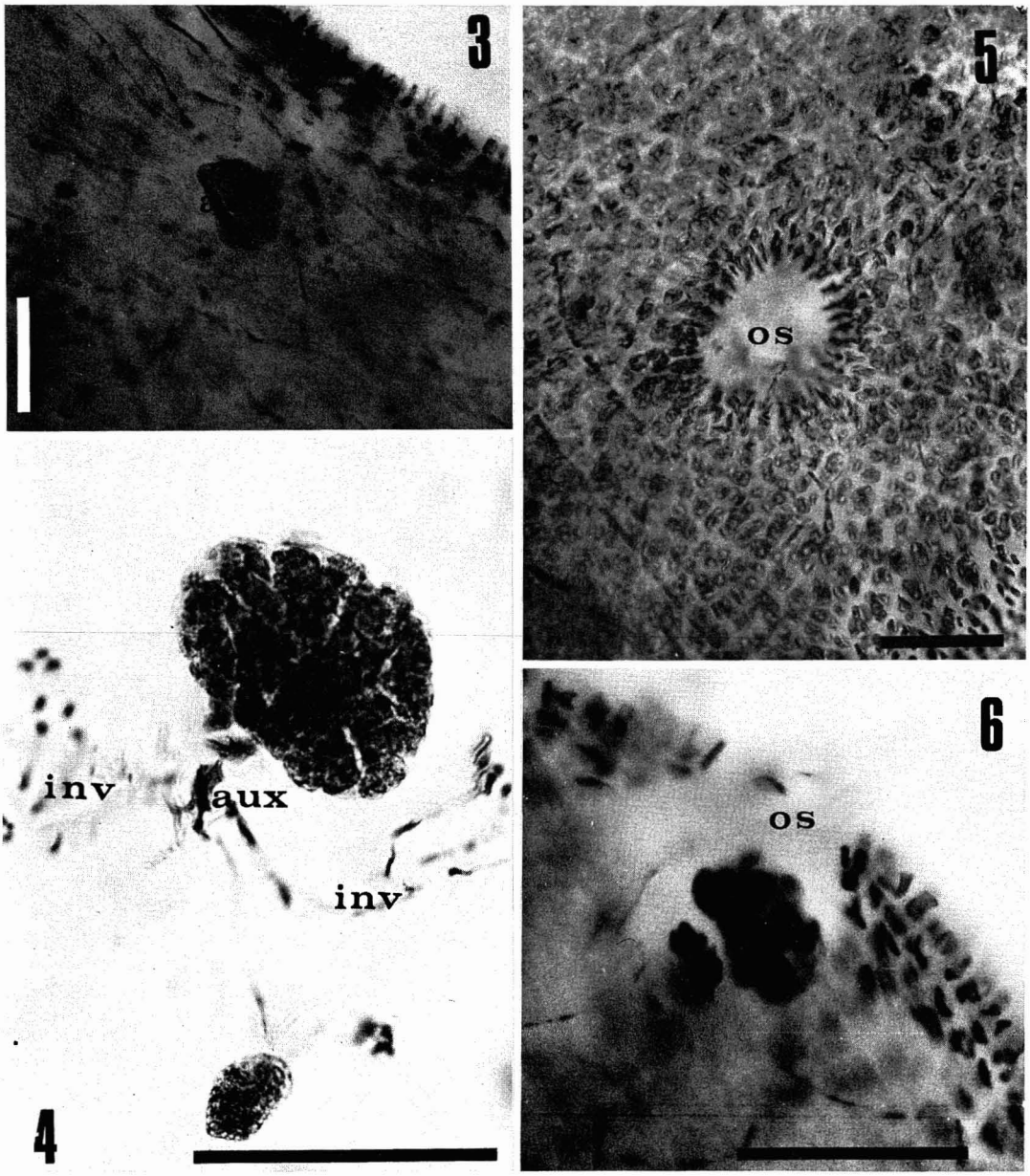

FIGURES 3–6. *Titanophora marianensis* sp. nov. *3*, optical section showing an auxiliary cell (aux) situated near the outer layer of the medulla; *4*, mature carposporophyte surrounded by two involucral filaments (inv) that are produced laterally on the auxiliary cell; *5*, surface view of the thallus showing carpostome (os); *6*, section showing carpostome (os) above the mature carposporophyte. Scales = 50 μm.